

EE 100

DMM and DC Power Supply LabVIEW Experiment Guide

1. Objectives

The purpose of this experiment is to show you how to interface your DMM and DC Power Supply to LabVIEW.

I. World of LabVIEW

LabVIEW consists of many components – the Measurement and Automation Explorer, the LabVIEW, the Data Acquisition (DAQ) module, the NI 488.2 interface etc. In this class, you will be concerned with the Measurement and Automation Explorer, LabVIEW and the DAQ module.

II. Using the Measurement and Automation Explorer

First, let us verify that the multimeter and function generator are hooked up to the GPIB card in your computer. To do this, we will use the Measurement and Automation (M&A) Explorer. Please note: “click” means “left-click”.

1. Log into the computer station on your workbench (your TA should give you login instructions)
2. Start the M&A explorer: (see figure 1)
Start→All Programs→National Instruments→Measurement and Automation

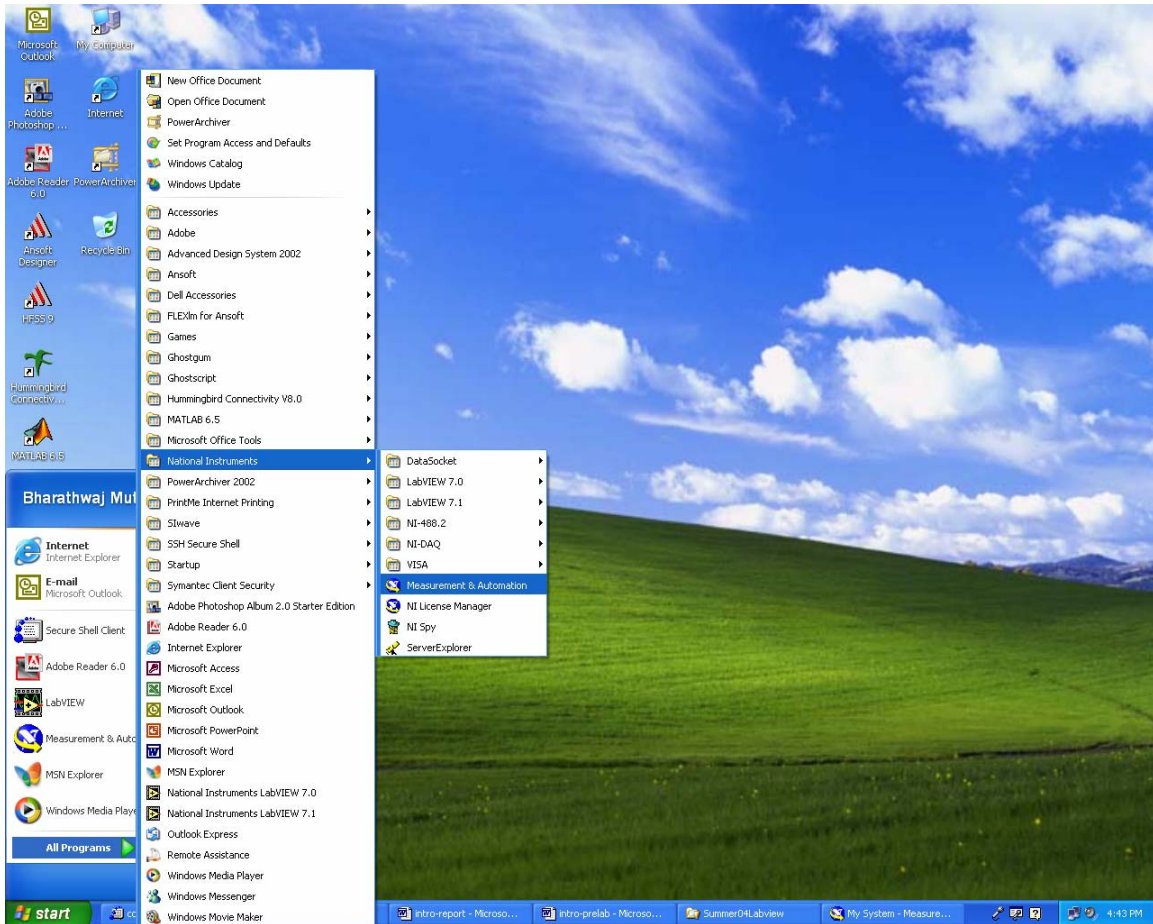


Figure 1. Starting the M&A explorer

The screen shown in figure 2 should pop up. Before going further, make sure the multimeter and power supply are on.

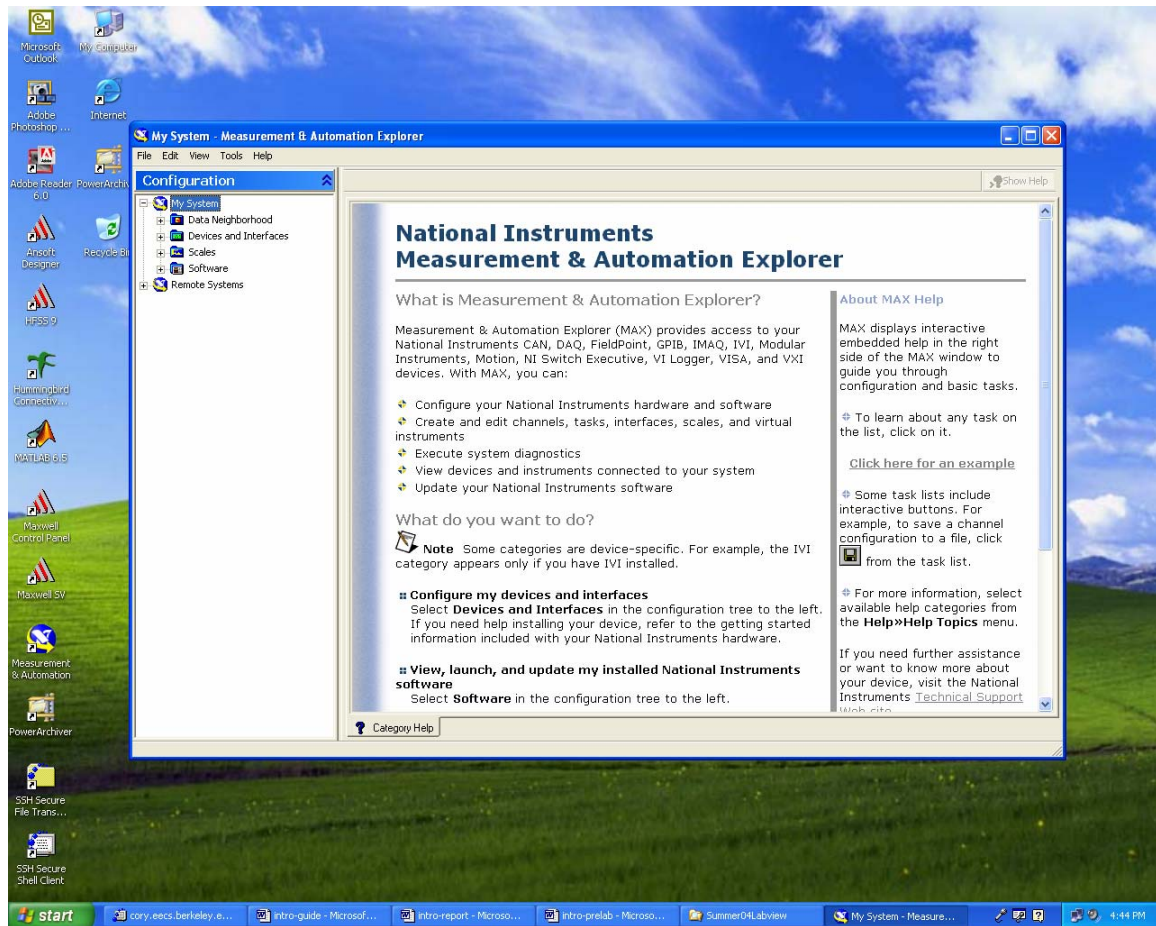


Figure 2. The M&A explorer

3. Click on the “+” next to **Devices and Interfaces** to expand it.
4. Right click on **GPIB0 (PCI-GPIB)** and select **Scan for Instruments** as shown in figure 3 (**MAKE SURE THE MULTIMETER AND POWER SUPPLY ARE TURNED ON FIRST**). The result on my computer is shown in figure 4.

Note: The exact GPIB bus number that is displayed will vary from computer to computer. The number may not be the same as mine. Please use **YOUR** bus number from now on in this lab guide.

Once you interface to the instrument(s) from M&A explorer, you should see the multimeter screen show “Adrs and Rmt”. The power supply screen will show “Rmt”.

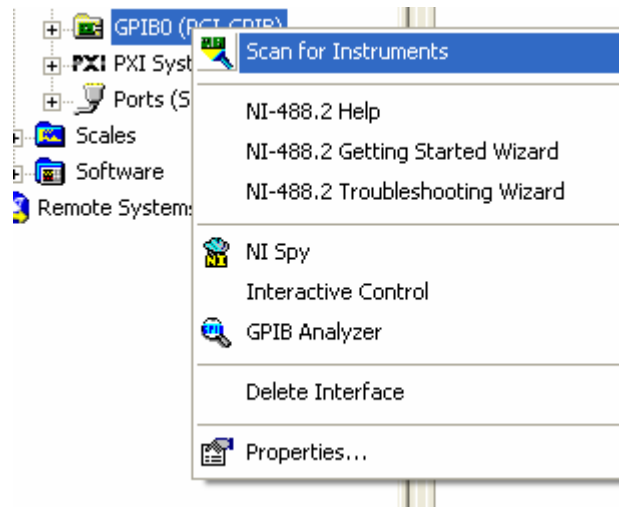


Figure 3. Scanning for instruments on the GPIB bus

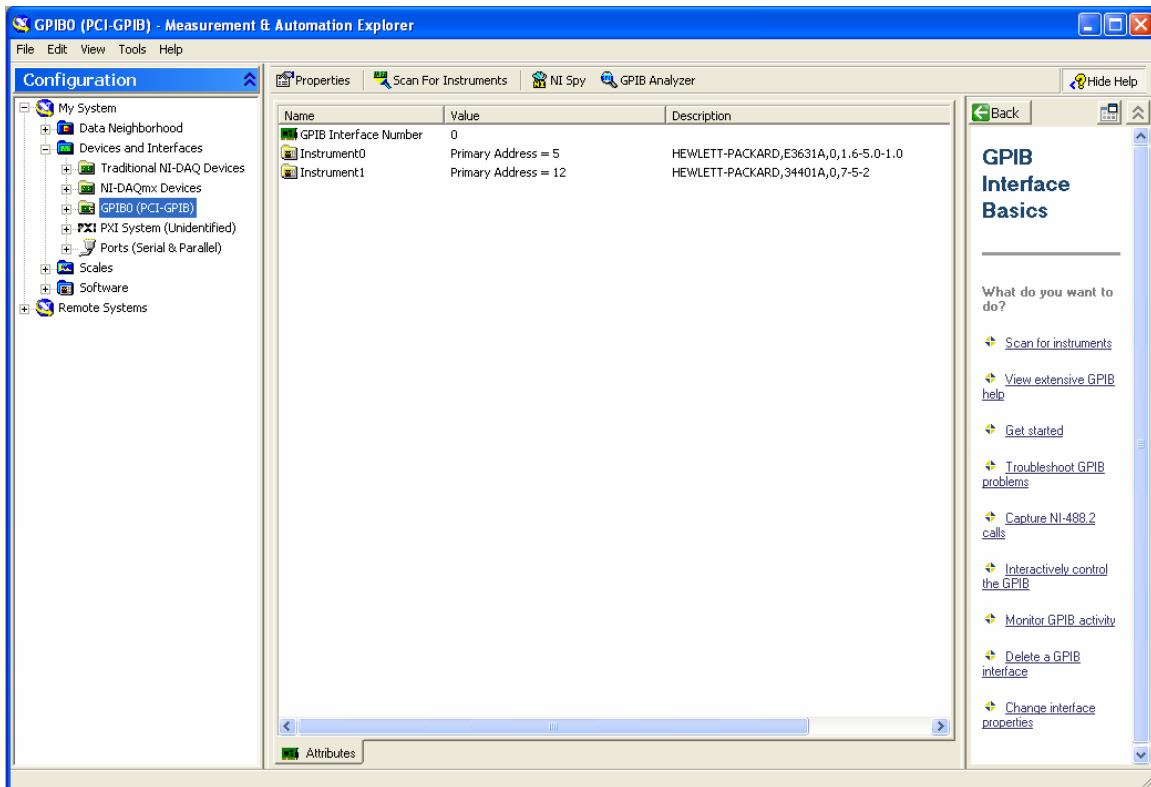


Figure 4. Found two instruments: power supply (E3631A) on address 5 and multimeter (34401A) on 12.

Once your instruments are recognized by the M&A explorer, proceed to the next section.

III. LabVIEW VI for the DC Power Supply and Multimeter

Once you have interfaced to the instruments, the next step is to use LabVIEW VIs to talk to the instruments. First start LabVIEW (refer to figure 5):

1. Start→All Programs→National Instruments→LabVIEW 7.1→LabVIEW

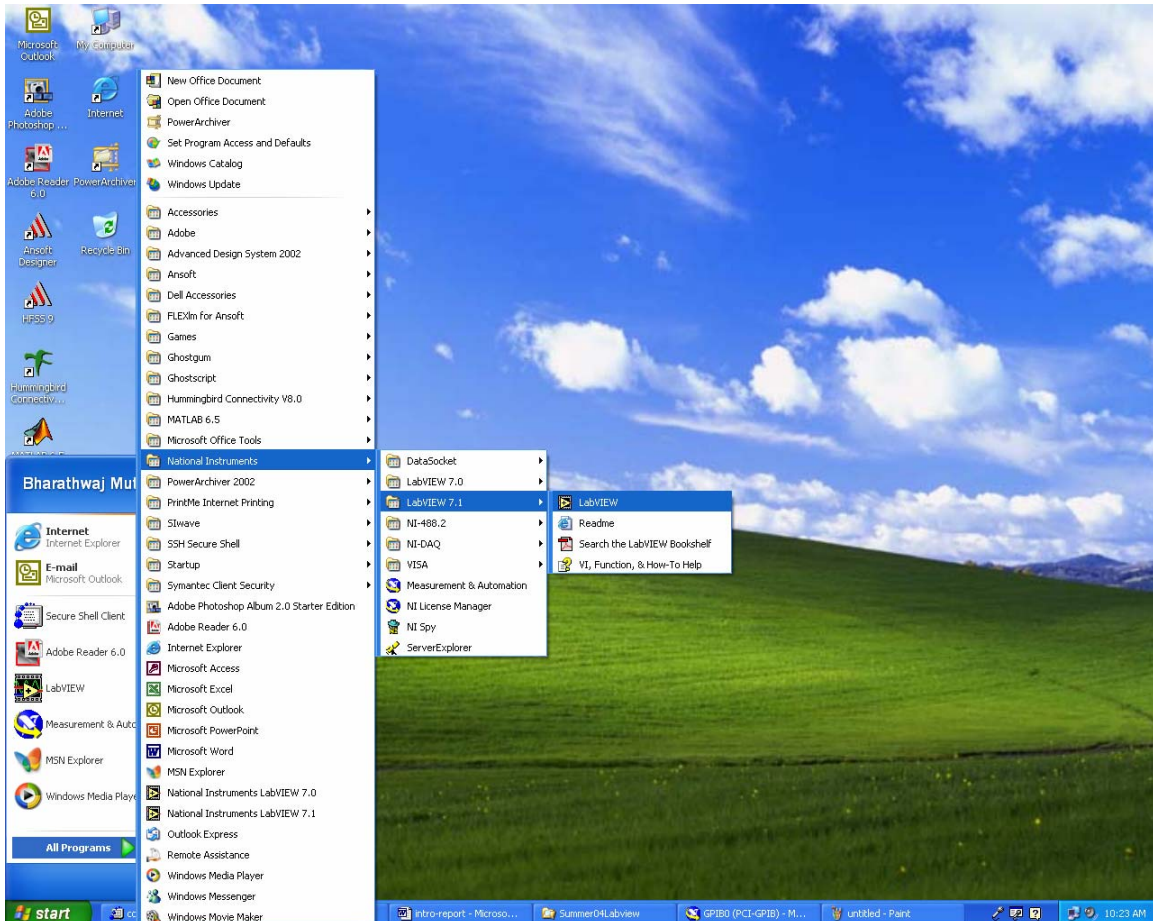


Figure 5. Starting LabVIEW

If the screen in figure 6 pops up, click *Continue*. You should see screen 7.

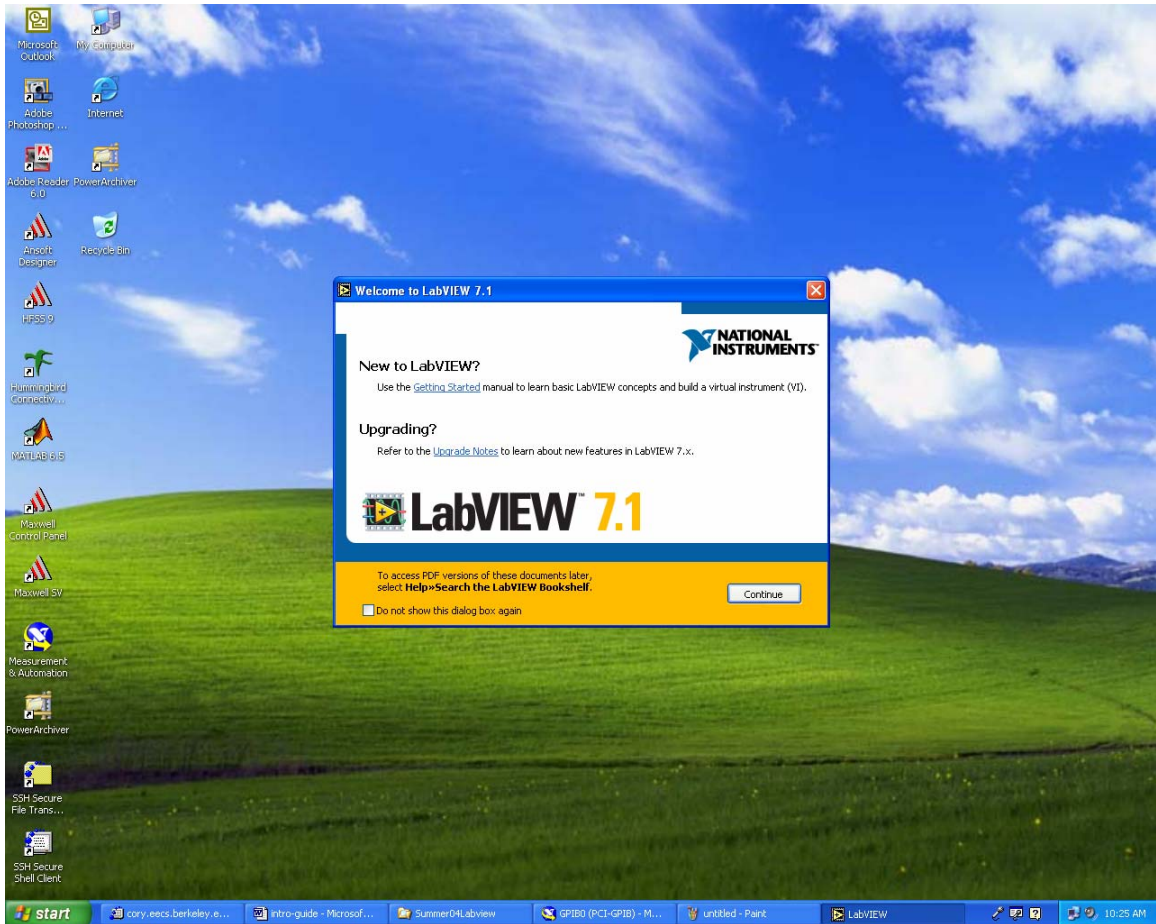


Figure 6. Starting LabVIEW

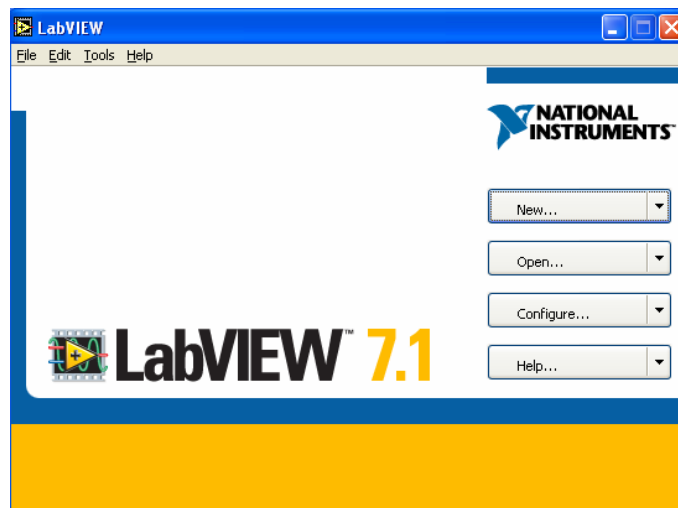


Figure 7. LabVIEW is ready for use

Good news: VIs for your multimeter and DC power supply are already installed. You just have to learn how to use them!

a. LabVIEW setup for the DC Power Supply

1. Click the *Open* drop down box in figure 7. You should see figure 8.

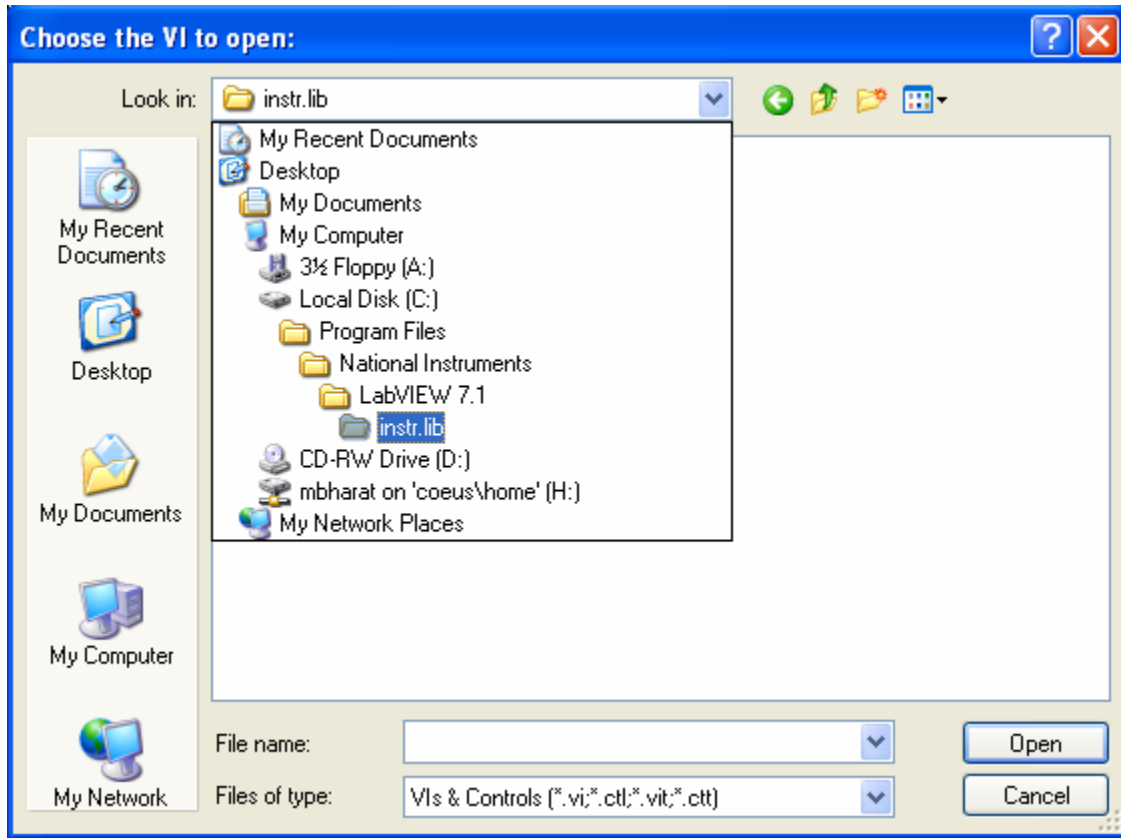


Figure 8. The instrument VIs are in C:\Program Files\National Instruments\LabVIEW 7.1\instr.lib

Navigate to the instr.lib directory as shown in figure 8. Figure 9 shows the instruments installed.

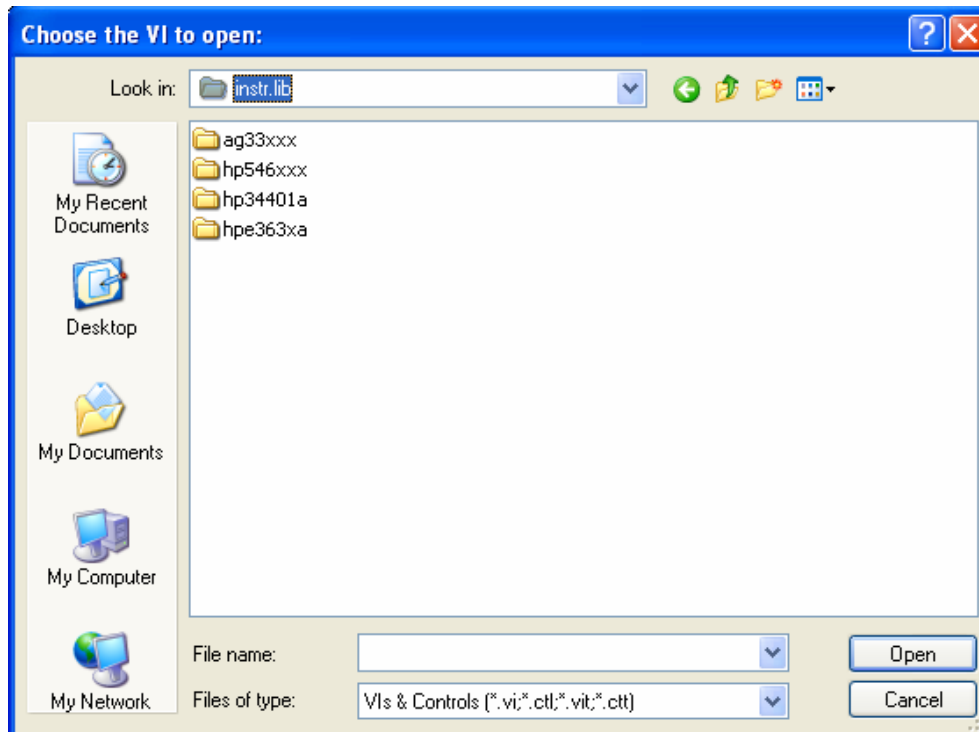


Figure 9. LabVIEW Instrument VI folders are listed by part number; these numbers are on the front panel of the instrument.

2. Double click on the *hpe363xa* folder.
3. Double click on the *hpe363xa* file. Two dialogs (refer to figure 10) will pop up.

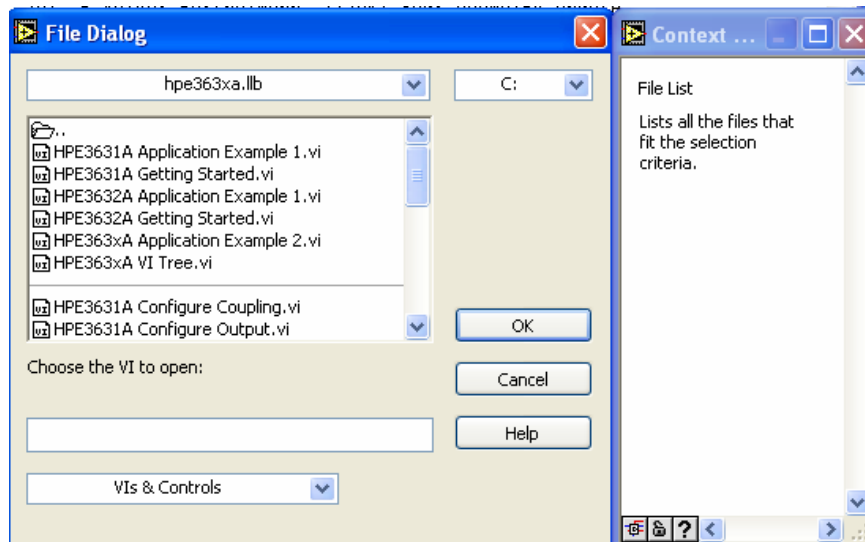


Figure 10. Choose the HP3631A Getting Started VI

4. LabVIEW provides context sensitive help – the help comment will change depending on what you do. Moving the mouse cursor over a different element will give help related to that element. But first, double click on *HPE3631A*

Getting Started.vi to open up the LabVIEW VI. You choose the HPE3631A because that is the DC power supply you have on your work bench. The LabVIEW VI will open – see figure 11.

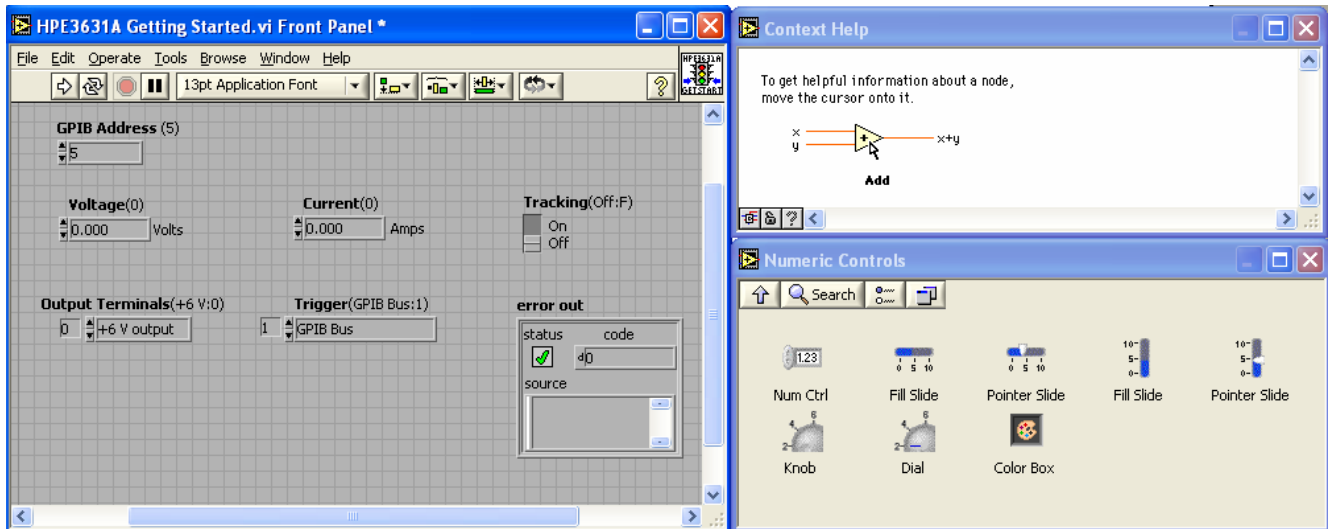


Figure 11. The LabVIEW front panel and other windows

I will give a brief overview of the different components of a LabVIEW VI. Bear in mind this is only a brief overview – for details, you should refer to the *Getting Started with LabVIEW* document available from the EECS 40 LabVIEW homepage.

The most important component of the LabVIEW is the *Front Panel*. This is how you interface to your VI. The front panel will have pretty much the same components as a real instrument – buttons, knobs, displays etc.

How do the components on the Front Panel actually work? To answer this question, click *Window* on the Front Panel menu bar and then click *Show Block Diagram*. Figure 12 will pop up.

Figure 12 shows the block diagram along with *Sub VIs*. As the name suggests, a sub VI is embedded within a bigger VI and does one task. Figure 13 shows the mouse cursor moved over the HP363xA Sub VI. The Context Help gives more information about the Sub VI. To open it, right-click the Sub VI and choose *Open Front Panel*.

You should continue to explore LabVIEW whenever time permits. In this introductory lab, we will just use the power supply and multimeter VIs.

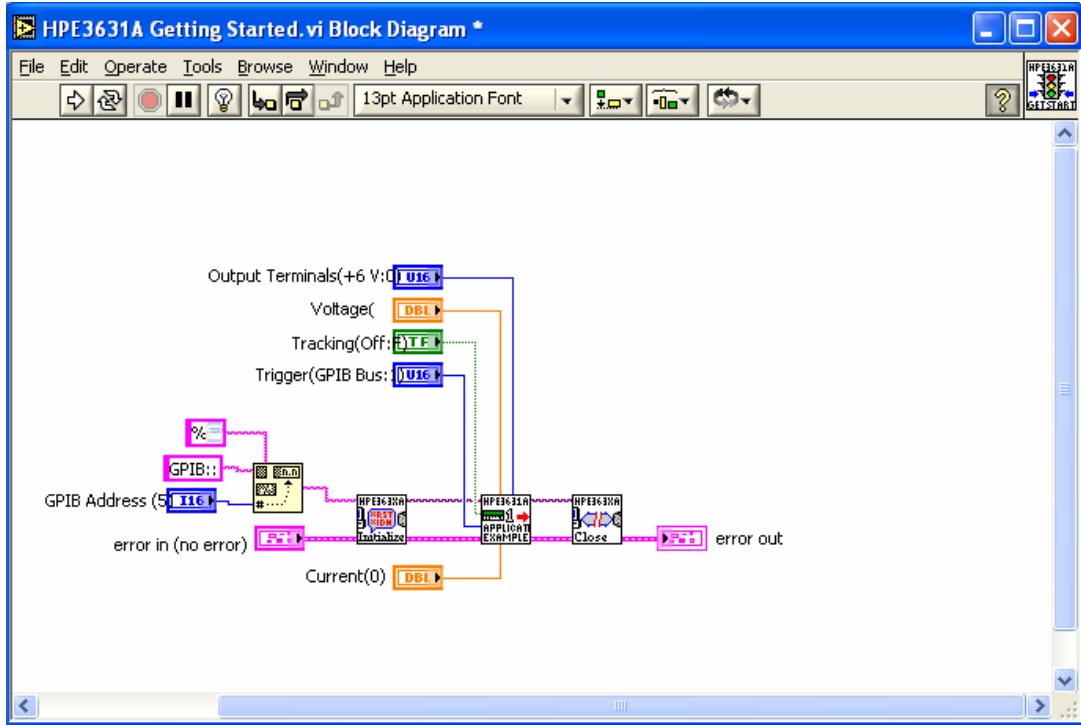


Figure 12. The LabVIEW block diagram

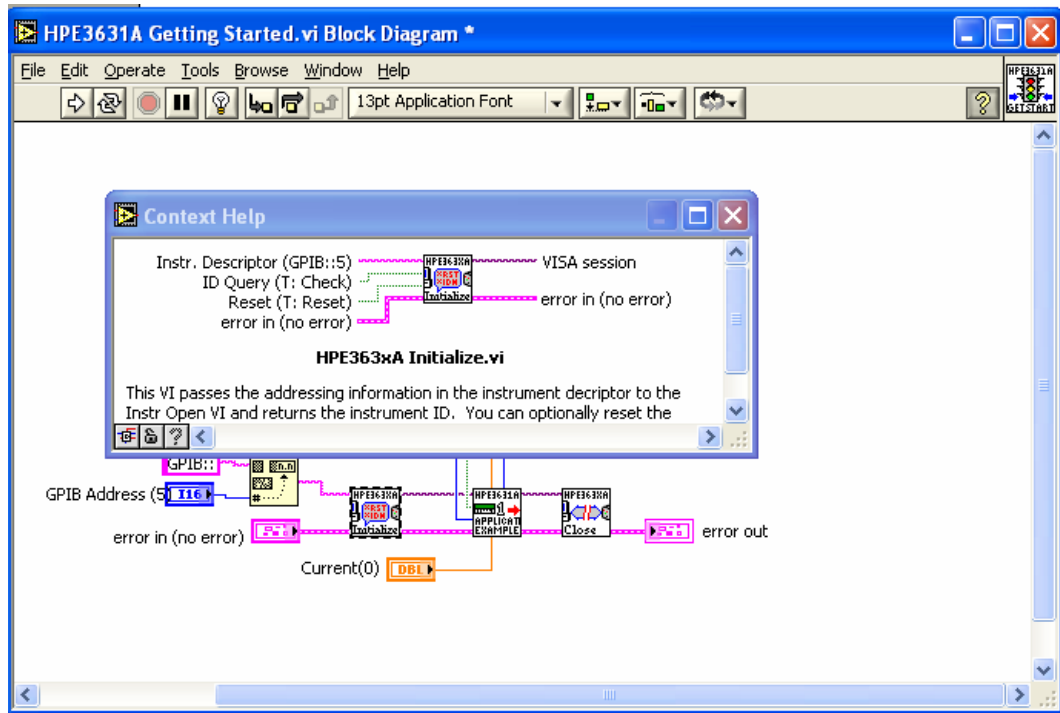



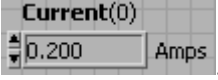



Figure 13. The HPE363xA Initialize Sub VI

5. Close the block diagram by clicking on the  in the top-right corner.
6. First, you need to set the correct GPIB address for the power supply in the **GPIB Address (5)**  box. Enter the number by clicking in the box.
7. Now, let's set the output voltage and the current limit. Click in the Voltage box, type 3 and press enter: . Click in the Current box, type 0.2 and press enter: .
8. You are almost done! Run the VI by clicking on the  button in the LabVIEW toolbar.

You should see the display on the power supply change to reflect your settings. Congratulations! You have interfaced the DC power supply to LabVIEW. Next, I will show you how to interface the multimeter to LabVIEW.

Please note: the steps involved in opening a VI for another instrument is the same procedure outlined on pages 1 through 11 of this lab guide. Hence, I will be referring back to these pages in the multimeter section of this guide and in other labs as well. To interface to the multimeter:

1. Click on *File*→*Open* from the HPE3631A Getting Started VI Front Panel menu bar, as shown in figure 14.

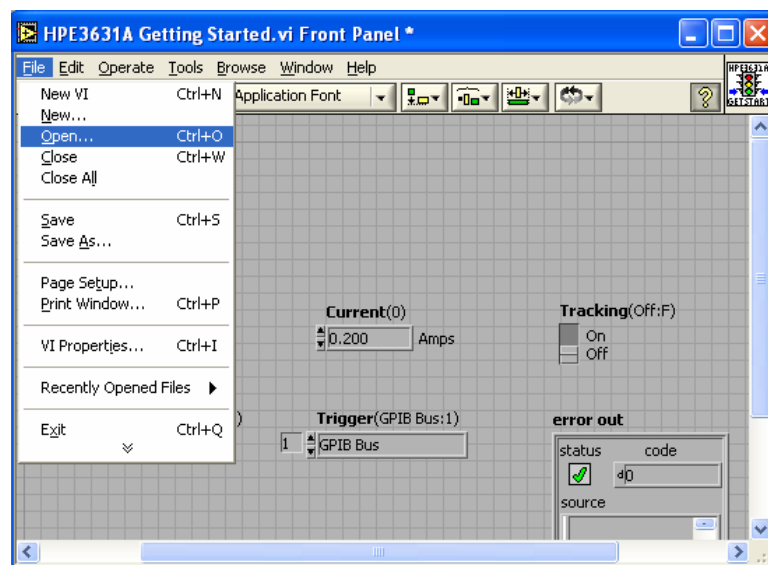



Figure 14. Opening a new VI

2. Navigate to the *HP34401A* folder by clicking on  .
3. Open the *hp34401a* library and choose the *HP34401A Getting Started VI*. Figure 15 should pop up.

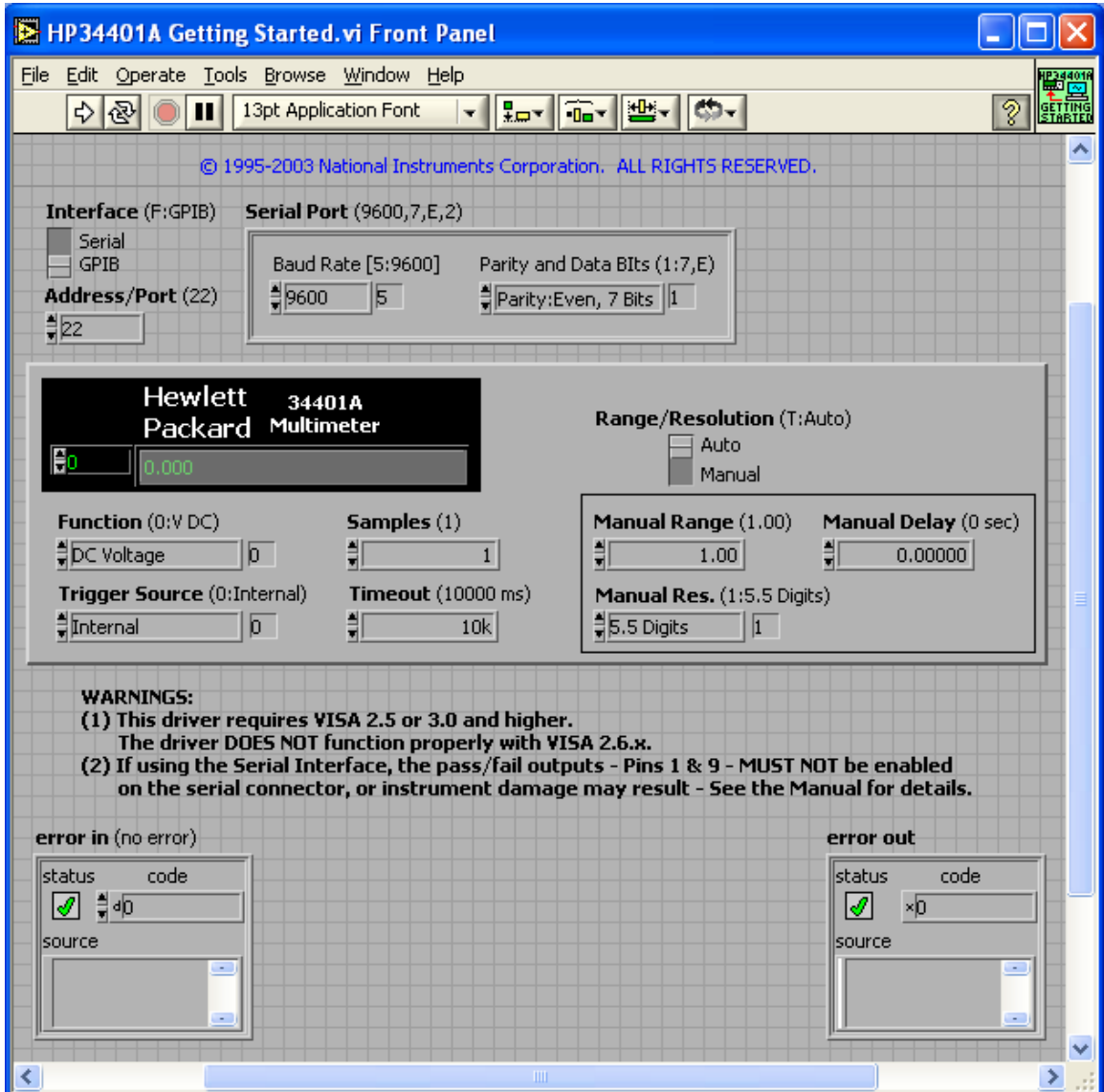
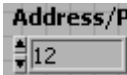
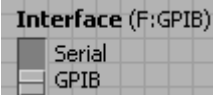



Figure 15. The HP34401A Getting Started VI front panel

4. Type in the correct GPIB Address in:  and make sure the  Interface is GPIB:  .

3. Hands On

a. Components Checklist

Make sure you have the following components on your workbench BEFORE you begin the experiment.

1. Wires
2. Alligator clips or Banana plugs
3. Two 1 k resistors
4. One 10 k potentiometer

b. Experiment

In this experiment, you will be doing the same steps as Lab 1 – but you will be using LabVIEW. Therefore:

- i. Measuring DC voltage using the multimeter
 - a. Turn on the power supply and the your multimeter. Set your multimeter to measure DC voltage. **USING YOUR LABVIEW DC POWER SUPPLY VI** adjust your power supply to output 5 V and then 14 V.
 - b. **USING LABVIEW MULTIMETER VI** measure the two voltage values.
- ii. Use multimeter to measure some resistors and pots.
 - a. Measure the resistance of your 1 k resistor using your LabVIEW multimeter VI.
 - b. Measure the resistance between the outer two legs of your potentiometer.
 - c. Measure the resistance between the middle leg and any of the outer two legs of your potentiometer.
- iii. Simple series circuit.
 - a. Build the circuit shown in figure 16 on your breadboard. Set V_x to be 5 V (using the DC power supply VI) and $R_1 = R_2 = 1\text{ k}$.

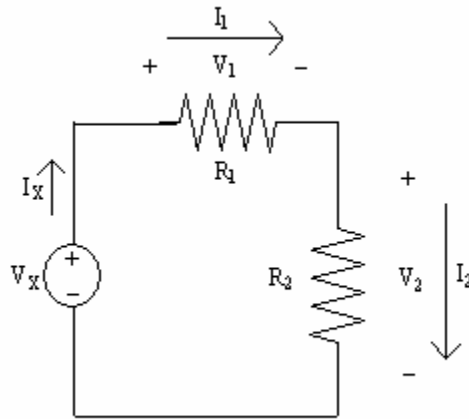


Figure 16. Simple series circuit

- b. Measure the voltage across and the current through R1 using the multimeter VI.
- iv. Simple parallel circuit.
- a. Build the circuit shown in figure 17. Set V_x to be 7 V (using the DC power supply VI) and $R_1 = R_2 = 1\text{ k}$.

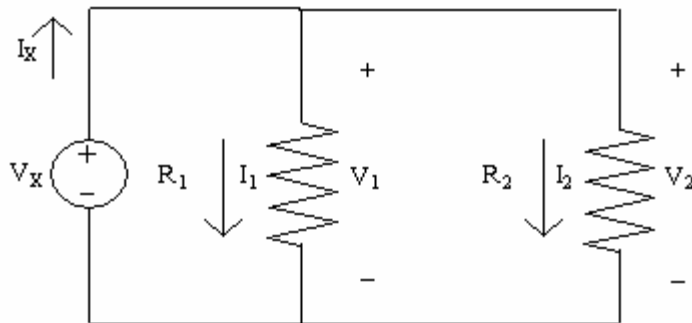
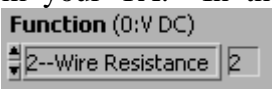


Figure 17. Simple parallel circuit

- b. Measure the voltage across and the current through R2.
- v. Setting some VI parameters

Let us use LabVIEW to set the precision of the multimeter:

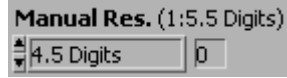
- a. Get a 1k resistor from your TA. In the HP34401A front panel, choose 2-wire

resistance measurement: .

- b. Change the Range/Resolution to Manual:



- c. Choose the Manual Range to be a 1000, and the resolution to be 4.5 digits



- d. Make sure the multimeter is powered on, the GPIB bus number in the HP34401A front panel is correct and the multimeter is connected to the 1k resistance. Run the program and record the measurement from the multimeter.